

**Summary of Results from
Test Drilling, Installation of Monitoring Wells, and Measurement of Water Levels
by the Department of Environment and Natural Resources
Related to the Proposed Hyperion Energy Center in Union County, South Dakota**

Test drilling and installation of monitoring wells were performed by the Geological Survey Program, Department of Environment and Natural Resources, from July 2, 2008, through September 2, 2008. The purpose of the work was to refine the existing understanding of subsurface geologic and hydrologic conditions in the area of the proposed Hyperion Energy Center and to establish some permanent ground-water monitoring sites. Fifteen holes were drilled, five of which were completed as monitoring wells. The locations of test holes and wells are shown on the illustration titled *Test drilling and well installation in 2008 in the area of the proposed Hyperion Energy Center*.

The understanding of subsurface conditions prior to the new drilling was based on (1) the two publications listed below, (2) an online database of test-hole and well information (<http://www.sddenr.net/lithdb>), and (3) additional well information in the files of the Water Rights Program, Department of Environment and Natural Resources. The two publications are as follows.

McCormick, K.A., and Hammond, R.H., 2004, *Geology of Lincoln and Union Counties, South Dakota*: South Dakota Geological Survey Bulletin 39

For free download of this report, navigate to the following web address and scroll down to B-39.

http://www.sddenr.net/publist/search_results_publist.cfm?limit_to_download=Yes&sql_option=2

Niehus, Colin A., 1994, *Water resources of Lincoln and Union Counties, South Dakota*: U.S. Geological Survey Water-Resources Investigations Report 93-4195.

This publication can be viewed online at <http://pubs.er.usgs.gov/usgspubs/wri/wri934195>

The surface footprint of land rezoned for the proposed Hyperion Energy Center (taken from <http://www.hyperionec.com/files/FinalPDBoundary.pdf>) sits largely on ground moraine which is a type of glacially derived sediment named till. The relationship of the footprint of the rezoned land to the surface geology is shown on the illustration titled *Map of surface geology in the area of the proposed Hyperion Energy Center*. An older bedrock surface exists at various depths below the glacial sediments. The elevation and types of bedrock that comprise this surface are shown on the illustration titled *Map of bedrock geology in the area of the proposed Hyperion Energy Center*. This bedrock surface is coincident with land surface at a few locations in the immediate area of the proposed Hyperion Energy Center (see labels Kc and Kg along Brule Creek on the map showing surface geology). A more complete description of the surface and subsurface geology is available in McCormick and Hammond (2004).

A buried sand and gravel aquifer exists in the vicinity of the proposed Hyperion Energy Center. This aquifer is named the Lower-Vermillion-Missouri aquifer where it occurs north of the Missouri River valley and the Missouri aquifer where it occurs under the Missouri River valley. The illustration titled *Cross section showing subsurface geology below the proposed Hyperion Energy Center* shows the relationships of the various geologic units, including the sand and gravel aquifer (labeled Qpio on the cross section), under part of the proposed energy center.

Based on a pre-existing network of observation wells maintained and measured by the Water Rights Program, Department of Environment and Natural Resources, appropriate locations for new, permanent water-quality monitoring wells were selected in the vicinity of the proposed Hyperion Energy Center. The locations of the newly installed water-quality monitoring wells and the other wells used to establish the flow direction of ground water in the aquifer are shown in the illustration titled *Ground-water flow direction in the buried sand and gravel aquifer in the area of the proposed Hyperion Energy Center*.

Three monitoring wells were installed in the buried aquifer and two monitoring wells were installed in surface sediments near Brule Creek. Of the three wells installed in the buried aquifer, one well (R2-2008-23) is in an up-gradient direction and two wells (R2-2008-22 and R2-2008-24) are in a down-gradient direction from the proposed Hyperion Energy Center. Similarly, one of the two wells installed in surface sediments near Brule Creek is in an upstream direction (R20-2008-03) and the other is in a downstream direction (R20-2008-04) from the proposed Hyperion Energy Center.

In general, the test drilling confirmed the descriptions and illustrations of subsurface geology presented in McCormick and Hammond (2004) and Niehus (1994). Two noteworthy differences are as follows.

1. The elevation and type of the first bedrock unit encountered in the newly drilled test holes were not always consistent with the published map of bedrock geology in McCormick and Hammond (2004). The new test-hole data were used to modify the published map of bedrock geology.
2. The buried sand and gravel aquifer does not exist as far to the east as the published reports indicated in the immediate vicinity of the proposed Hyperion Energy Center. The eastern boundary of the aquifer was modified using (a) new and existing test-hole data and (b) an evaluation of the possible eastern extent of the aquifer as compared with bedrock topography.

The five monitoring wells installed in 2008 will become part of a much larger statewide network of water-quality monitoring wells named the Statewide Ground Water Quality Monitoring Network. A report about the larger monitoring-well network can be downloaded for free. Navigate to the following web address and scroll down to UR-89.

http://www.sddenr.net/publist/search_results_publist.cfm?limit_to_download=Yes&sql_option=17

The five newly installed monitoring wells will be used to document the quality of ground water prior to any construction activity that may be forthcoming related to the proposed Hyperion Energy Center. The wells will also be used to examine the quality of the ground water over time similar to the other wells in the Statewide Ground Water Quality Monitoring Network.